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Indian Standard

SPECIFICATION FOR TANGENT CLINOMETER

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SPECIFICATION FOR TANGENT CLINOMETER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 December 1970, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 The tangent clinometer is intended for determining differential heights and is used in conjunction with the plane table. It consists of a gun metal base with three studs or feet on the underside, carrying a hollow metal carriage of square section in which a spirit level is mounted. This carriage is pivoted at one end to the base, the other end being provided with an adjusting screw for bringing the bubble central. A folding side vane is fitted to each end of the level arm. On the longer vane two scales are engraved with either degrees on one side and natural tangents on the other side or natural tangents on both sides. The difference in height is obtained either by multiplying the natural tangents by the distance as measured by an accurate scale or directly by means of a height indicator.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard deals with the requirements of tangent clinometers.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply (*see* Fig. 1).

2.1 Adjusting Screw — A screw to make the carriage truly level when the instrument is placed on a plane table.

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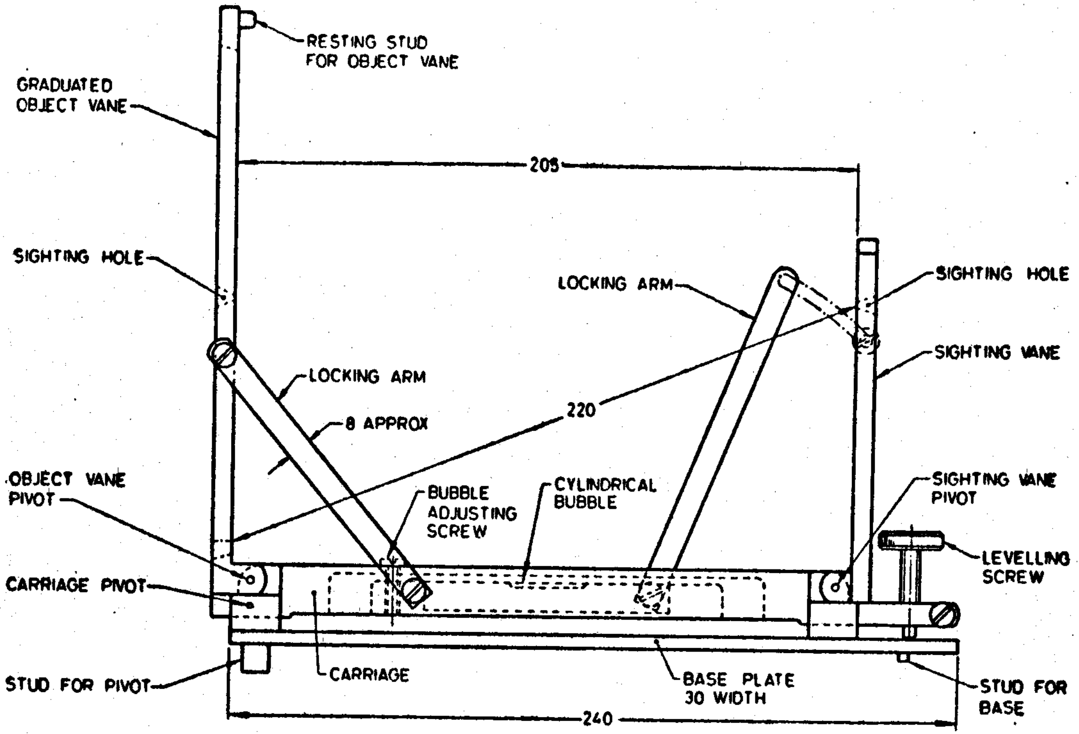
*Rules for rounding off numerical values (*revised*).



All dimensions in millimetres.

FIG. 1 NOMENCLATURE AND DIMENSIONS OF TANGENT CLINOMETER

2.2 Arms — The supports for keeping the vanes truly vertical for observation.

2.3 Base — The lower part of the instrument to which the carriage is attached. The bottom of the base is provided with three short studs for placing the instrument on a plane table.

2.4 Carriage — The part of instrument which moves on a pivot at one end to which a sighting vane and pitch vane are attached at other end. In the central hollow portion of the carriage, the spirit bubble is fitted.

2.5 Height Indicator — A chart to give the difference of height from the readings taken with the clinometer to eliminate computation.

NOTE — Height indicator charts which are adjunct to this standard are available from Survey of India, Dehra Dun.

2.6 Vanes — The vertical members pivoted to either end of the carriage for sighting purposes. The sighting vane which is near to the eye is provided with a sighting hole and a short scale of tangent graduation for collimating the instrument. The object vane is provided with a scale of natural tangents on one side and degrees on the other or may have the scales of natural tangent on both sides. The sighting hole is provided on the object vane for adjustment of the instrument.

3. MATERIAL

3.1 The various parts of the clinometer shall be manufactured from brass except for the bending screw which shall be of gun metal and provided with a steel tip. The steel tip of the bending screw shall rest on a steel plug fitted on to the face. The pivots on which the carriage or the vanes rotate shall have a pin of hardened steel and a brass bush.

4. DIMENSIONS AND ACCURACIES

4.1 The dimensions of tangent clinometer shall be as given in Fig. 1.

4.2 The bubble shall be cylindrical bubble of 50 × 9 mm conforming to IS : 1632-1960* and having a sensitivity of 20 ± 4 minutes per 2 millimetre run.

4.3 The sighting vane (*see* Fig. 2) shall be marked with tangent graduations from +0·04 to −0·04. The graduations being at an interval corresponding to 0·005 and each line of 0·02 shall be longer and figured with the corresponding value.

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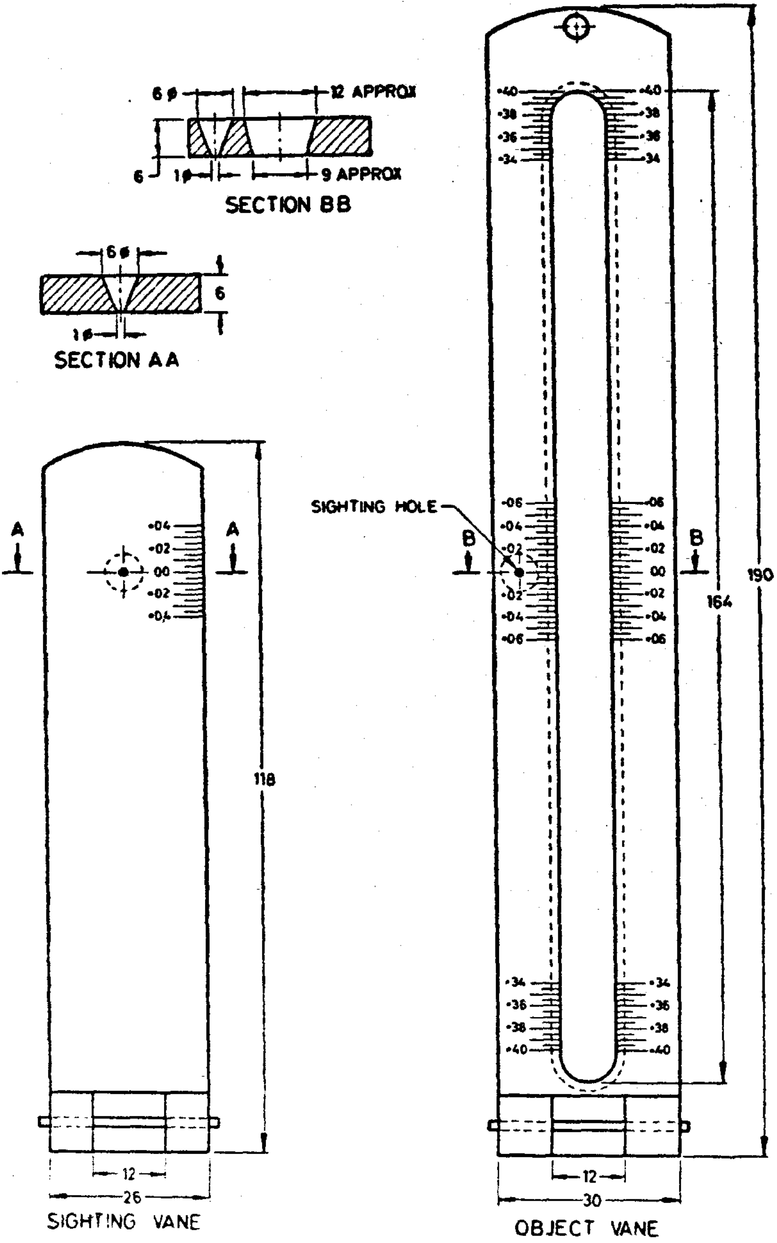
*Specification for bubbles.



All dimensions in millimetres.

FIG. 2 DETAILS OF SIGHTING VANE AND OBJECT VANE

4.4 The object vane (*see* Fig. 2) shall be marked with graduations from + 0·4 to – 0·4. The distance between the extreme graduations of this scale shall be 164 ± 0·5 mm. The graduations on the scale shall be at an interval corresponding to 0·005 and each line of 0·02 shall be longer and figured with the corresponding value.

4.5 The distance from the sighting hole to the inside of object vane of the lowest graduation of — 0·4 on the pitch vane shall be 220 mm.

5. GENERAL REQUIREMENTS

5.1 The clinometer shall be so manufactured that when the vanes are opened and locked with the arms, they are truly at right angle to the carriage within a tolerance of ± 1°.

5.2 The adjusting screw shall have threads of nominal diameter 8 mm with a pitch of 0·5 mm and shall be provided with a large knurled head.

5.3 The bubble shall be mounted in the hollow middle portion of the carriage and shall be fixed on one side, the other side being adjustable by means of a screw for occasional adjustments which shall be spring loaded.

5.4 The graduations on the scale shall be engraved with clear fine lines and relevant figures.

5.5 The centre of sighting hole on the object vane shall be in horizontal alignment with zero of the scale on the object vane. When the bubble is adjusted to horizontal position, the sighting hole on the side vane and the object vane shall be in a horizontal line.

6. WEIGHT

6.1 The weight of the clinometer shall not exceed one kilogram.

6.2 The weight of the wooden or leather carrying case shall not exceed 0·5 kg.

7. WORKMANSHIP AND FINISH

7.1 The various components of the clinometer shall be manufactured and assembled with good workmanship and all parts shall function smoothly without undue stiffness or play. The locking arms for the pivot shall have a positive locking in the true position.

7.2 The adjusting screw shall be such that there shall be no backlash or jerk during adjustment.

7.3 All sharp corners shall be rounded and middle surface polished.

8. MARKING

8.1 Each clinometer shall be legibly and indelibly marked with the name, initials or trade-mark of the manufacturer and the year of manufacture.

8.1.1 The clinometers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously cheched by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufactarers or processors, may be obtained from the Indian Standard Institution.

9. PACKING

9.1 Each clinometer shall be packed in a wooden or metallic box with suitable cushioning material to prevent damage during transit.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	$1\ \mathrm{N} = 1\ \mathrm{kg.1\ m/s^2}$
Energy	joule	J	$1\ \mathrm{J} = 1\ \mathrm{N.m}$
Power	watt	W	$1\ \mathrm{W} = 1\ \mathrm{J/s}$
Flux	weber	Wb	$1\ \mathrm{Wb} = 1\ \mathrm{V.s}$
Flux density	tesla	T	$1\ \mathrm{T} = 1\ \mathrm{Wb/m^2}$
Frequency	hertz	Hz	$1\ \mathrm{Hz} = 1\ \mathrm{c/s}\ (\mathrm{s^{-1}})$
Electric conductance	siemens	S	$1\ \mathrm{S} = 1\ \mathrm{A/V}$
Pressure, stress	pascal	Pa	$1\ \mathrm{Pa} = 1\ \mathrm{N/m^2}$

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